

PR's Dr. Roquemore leads team to award *by Adrian DeNardo, Propulsion Directorate*

WRIGHT-PATTERSON AFB, Ohio — A multi-agency team led by Mel Roquemore, of the Air Force Research Laboratory's Propulsion Directorate, was honored with the Pollution Prevention Program of the Year Award from The Strategic Environmental Research and Development Program (SERDP) office in a presentation held Nov. 27, 2001. A joint DoD, DOE and EPA program, the SERDP recognized the Trapped Vortex Combustor (TVC) program as the best for 2001.

The TVC concept grew from fundamental studies of flame stabilization conducted by Roquemore, a senior Combustion Scientist, who serves as scientific and technical advisor and international authority for basic research, exploratory development, and advanced development in air breathing combustion diagnostics, and integrated fuel system technologies.

AFRL conducted these studies to better understand why jet engines sometimes "blew out" while in flight. Not only does the TVC significantly reduce this problem, but it also produces impressive numbers from a pollution control perspective.

Using the TVC produces a three-way performance improvement, which includes a 40% expansion of the operating envelope, a 50% decrease in engine blowout, and a 50% improvement in re-light if blowout occurs.

The pollution prevention numbers are equally impressive. Use of the TVC in turbine engines could reduce aircraft emissions to 50% below the International Civil Aviation Organization standard for Nitrogen Oxides (NO_x), and a comparable amount for Volatile Organic Compounds (VOCs). Compared to conventional combustors used in marine gas turbine engines, a TVC-equipped turbine engine will reduce yearly emissions of NO_x and VOCs from Navy ships by 52% and 60%, respectively. When applied to various fleets of aircraft, turbine powered ships and stationary power plant turbines, the TVC use will reduce NO_x emissions by 95 million pounds per year and VOCs by 300 million pounds per year.

The TVC is an innovative design that departs from the traditional swirl stabilized combustor designs used in gas turbine engines for the past 40 years. It consists of a pilot combustor for stability and a main combustor for power. The pilot contains cavities sized to trap a vortex, thus the name TVC.

It is a simple design that provides low NO_x because it operates with high flow-through velocities (low residence time), low fuel to air ratios, and good mixing in the main and trapped vortex pilot combustors. AFRL, General Electric Aircraft Engines, Naval Sea and Air Systems Commands, and National Energy Technology Laboratory have been developing the TVC with funding from SERDP and other sources.

The 25 member award winning team was made up of representatives from AFRL's Propulsion Directorate, Wright-Patterson AFB, Ohio; Naval Sea Systems Command, Washington, D.C.; Naval Air Systems Command, Patuxent River, Md.; the National Energy Technology Laboratory, Morgantown, W. Va.; General Electric Aircraft Engines, Cincinnati, Oh.; and Innovative Scientific Solutions Incorporated, Dayton, Oh. @